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New chewing gum base and process for preparing same and their use in a chewing gum.

The present invention is a homogeneous gum base composition which includes a properly plasticized elastomer component and a properly plasticized resin component, and optionally, a third component having fillers, emulsifiers, and/or softening agents, texturizing agents and waxes normally associated with production of chewing gum base. This invention also includes a method of preparing the novel chewing gum base as well as their use in a chewing gum.

NEW CHEWING GUM BASE AND PROCESS FOR PREPARING
SAME AND THEIR USE IN A CHEWING GUM

The present invention relates to the art of chewing gum base composition and, in particular, to novel chewing gum base compositions in which desired characteristics can be achieved by unique combinations of primary components heretofore unknown.

Chewing gums, as they are known today, generally comprise a water-soluble flavor portion which is dissipated over a period of time, and a base portion which is insoluble and inert and is retained in the oral cavity throughout mastication. Depending on the intended effect of the particular chewing gum product, the base portion is composed with components selected from the effect achieved thereby and based on their compatibility.

One important component of a gum base is the elastomeric portion which, according to the present state of the art, can include natural elastomers, synthetic elastomers, or combinations thereof. This element of the gum base is important in that it provides the insoluble cud with resiliency to recover from deformation caused by chewing. In preparing gum base, it is important that other components included in the base composition which are included to effect various characteristics in the resulting chewing gum be thoroughly mixed with the elastomeric portion so that the entire cud retain proper resiliency as a homogeneous phase.

In order to achieve a homogeneous phase cud wherein a proper resiliency is constant throughout, it is necessary to provide components which are as nearly miscible with the elastomer as possible. This result is not easily

1 attained in the gum base art because the various components
must not only come together as a homogeneous mass during
initial mixing but must also remain in the homogeneous state
during chewing gum compounding with the water-soluble portion,
5 during processing, e.g., gum unit production and wrapping,
and while chewing. Factors such as the effect of the
water-soluble components, heat, moisture, etc. must be
considered in preparing a useable gum base.

Moreover, since, as in all food arts, chewing
10 gum production is necessarily constrained by economical,
processing, marketing, and safety factors, mere physical
and chemical compatibility is not the only concern. So
constrained, the art of making chewing gum has evolved
through the years by building only on known workable
15 combinations of useable ingredients. Consequently, in
attempting to achieve a particular attribute or combina-
tion of attributes in a chewing gum, it has been necessary
to utilize the component known to provide such attribute(s)
in the resulting gum along with that component's accompanying
20 compatibilizing ingredients which may detract significantly
from the end product or seriously constrain the use of
certain other additives such as flavorants, sweetener, anti-
oxidants, etc. with the particular component.

When adding resinous components to elastomers
25 problems enunciated above relative to compatibility are
especially troublesome, since both elastomers and resins
are polymers. The difference in the nature of an elastomer
from that of a resin is, among other things, one of degree
of internal mobility between polymer chains.
30

1 Both elastomers and polymeric resins inherently
have a characteristic intensity of intermolecular inter-
action, called the cohesive-energy density, which, in general,
must be overcome to some extent in order to achieve com-
5 patibility between these two types of components. Attraction
forces between organic molecules, which account for
the characteristic cohesive-energy density, include,
among other things, Van der Waals forces, dispersion forces,
dipole-dipole forces, dipole-induced dipole forces, and
10 acid base forces, of which the most important is hydrogen
bonding. A gross measure of all such forces can be
expressed as a Hildebrand solubility parameter, δ , which
is an expression of the solubility of a particular substance.

15 In theory, the miscibility of polymers relates
to those having comparable solubility parameters, which is
generally considered in the polymer art as those polymers
having a difference in solubility parameters of less than
1.7 - 2.0, S. Krause, "Polymer Compatibility", J. Macromol.
Sci-Macromol. Chem C7, pg. 251-314 (1972).

20 While it is known that straight mechanical shear-
ing may be used to intimately contact polymers having dis-
parate chemical and structural properties, such methods may
also depolymerize the components thus destroying desired
inherent polymer properties such as memory (i.e., elasticity)
25 and film forming capabilities (i.e., relative displacement
without rupture of intermolecular bonding). To overcome
these problems different ingredients have been used in an
attempt to compatibilize resins and elastomers without
total depolymerization.
30

1 In particular, the elastomer styrene-butadiene
copolymer (SBR) has in the past required the use of accom-
panying ester gums (glycerol esters of rosin) in order to
5 effect compatibilization with other chewing gum base com-
ponents, and in order to achieve film-forming properties
which is desired for bubble gum bases. The use of ester
gums with styrene-butadiene has, however, been found to
generate problems such as inherent oxidative instability
and tackiness in the chewing gum product. Furthermore,
10 chewing gum bases made by use of SBR and ester gums charac-
teristically are rigid, very hard, brittle, non-chewable,
and require a significant amount of energy as well as the
addition of extensive amounts of softeners, fillers, etc.
to achieve the proper texture for use in a chewing gum.
15 To overcome the defects associated with the use of styrene-
butadiene in combination with ester gums, those skilled in
the gum art have traditionally approached the problem on
a trial and error basis by incorporating additional ingre-
dients which provide the desired characteristics in the
20 end product.

 Now, however, by use of the present invention,
which contemplates proper plasticization principles applied
to the external plasticization of primary gum base components,
i.e., elastomer and resin, heretofor considered incompatible,
25 a soft, inherently stable SBR gum base can be produced which
also has excellent film-forming properties and is essentially
non-tacky.

 Similarly, with regard to polyisobutylene elasto-
mer (PIB) it has been considered necessary to include cer-
30 tain accompanying ingredients to effect compatibilization
with other gum base components. For example, U.S. Patent

1 No. 3,984,574 to Comollo discloses a gum base which includes
polyisobutylene in combination with polyvinyl acetate but
which also requires additional components such as hydrogenated
or partially hydrogenated vegetable oils or animal fats in
5 an amount of 5-50%, and filler (mineral adjuvants) in an
amount of 5-40%, in order to allegedly achieve an adhesive
or non-tacky base. Indeed, the use of filler with poly-
isobutylene/polyvinyl acetate in gum base is considered
common practice in the art.

10 Through the present invention, however, polyiso-
butylene can be combined with the characteristically good
film-forming high molecular weight polyvinyl acetate to
form a gum base of soft consistency in the absence of not
only filler, but also other softening additives usually
15 included in polyisobutylene such as hydrogenated or par-
tially hydrogenated animal fats or vegetable oils.

Furthermore, with respect to the use of isobuty-
lene-isoprene copolymer (butyl rubber), by use of the present
invention, a soft gum base with good film-forming character-
20 istics has been achieved in the absence of both ester gums and
filler thus making it useable as a bubble gum base.

Therefore, by means of the present invention,
many of the problems associated with compounding a desired
gum base can be overcome by a rational, technical approach,
25 which, in effect, reduces the trial-and-error method of
making gum to a predictable science.

In accordance with the present invention, a gum
base is provided which is formed essentially of a properly
plasticized elastomer, such as, for example, a styrene-
30 butadiene copolymer plasticized as described hereinafter;
a properly plasticized resin, such as, for example, polyvinyl

1 acetate, as described hereinafter; and, optionally a
third emulsifying/softening/texturizing component which may
include all other adhesive and adhesive types of components
generally used in gum base, for example, fillers, such as
5 calcium carbonate or talc, and/or waxes (natural or syn-
thetic) (hydrocarbon or ester type), fatty acids and fatty
acid esters, antioxidants, oils, resins (ester gums, poly-
terpene) and the like. Optionally, fillers such as cal-
cium carbonate and talc, and/or wax can be included in any
10 one or all three components to achieve a desired result.

Based on proper plasticization principles a
model gum base formulation scheme has been devised whereby
an elastomer such as SBR, polyisobutylene, and isobutylene-
isoprene copolymer and a resin such as polyvinyl acetate can
15 be blended in the appropriate proportions to attain the
proper texture, resiliency, flavor retention properties,
etc. without regard for the necessity of including extra-
neous ingredients required to make them compatible and/or
workable.

20 Based on previously-espoused theories it has not
been considered feasible to render a SBR chewing gum base
with film-forming properties in the absence of ester gums,
or a PIB/PVAC gum base in the absence of filler and other
additives, or a butyl rubber base useable in a bubble gum
25 composition. By means of the present invention, however,
excellent film-forming resins such as high molecular weight
polyvinyl acetate, i.e., in excess of at least about 20,000
M.W.U., can be made miscible with SBR, PIB, and butyl rubber.
In view of the application of solubility theories to the
30 compatibilizing of these primary polymer components this is
quite unexpected. Specifically, the primary resin, high mole-
cular weight polyvinyl acetate, has a solubility parameter

1 of approximately 10.6 (Collins, Bares, and Billmeyer, Jr.,
"Preliminary Evaluation of Polymer Properties", Experiments
5 in Polymer Science, page 108 (1973)), whereas the solubility
parameter of styrene-butadiene copolymer is approximately
8.3, and polyisobutylene is approximately 7.8 (Bandrup and
Immergut, "Solubility Parameter Values", Polymer Handbook,
pg. IV-362 - IV-365 (3d ed. 1967), which theoretically ren-
ders them somewhat incompatible and, at least, immiscible.

The elastomer component of the gum base of the
10 invention can contain primarily styrene-butadiene copolymer,
polyisobutylene, isobutylene-isoprene copolymer, natural
rubber (polyisoprene) as well as other masticatory substances
of natural origin, such as rubber latex solids, chicle,
crown gum, nispero, rosidinha, jelutong, pendare, perillo,
15 niger gutta, tunu, etc. The elastomer is employed in an
amount within the range of from 0.5 to about 30%, and
preferably from about 5% to about 20% by weight of the
gum base.

To achieve proper plasticization of the elastomer
20 component in order to gain compatibility, several chemical
compounds have been discovered to provide surprisingly good
plasticization and/or compatibilization of the elastomer
with other components, especially resin components.

In the preferred embodiments of the present inven-
25 tion, it has been found that plasticization can be achieved
with unique gum base component plasticizers, such as oleic
acid and butyl stearate, although any of the following
gum plasticizers may be employed: mono-, di-, or tri-
glyceryl esters of saturated or unsaturated fatty acids,
30 such as stearic acid, palmitic acid, oleic acid, caprylic
acid, capric acid, caproic acid, lauric acid and the like,

1 squalene, mineral oil and liquid petroleum hydrocarbons,
squalane, castor oil and other ricinoleate derivatives,
diethylene- or propylene glycols and derivatives, tributyl
acetyl citrate, tributyl citrate, lecithin, coconut oil,
5 glyceryl tributyrate, Zn laurate, Ca stearate, propylene
glycol monostearate, propylene glycol monolaurate, fatty
acids, butyl sebacate, butyl benzyl sebacate, diacetyl
tartaric acid esters of mono- and diglycerides of edible
fat oils or edible fat forming acids, petrolatum, stearyl
10 monoglycerides citrate, limonene, polylimonene, poly-
ethylene, butyl lactate and butyl oleate.

Preferably, the styrene-butadiene copolymer is
plasticized by use of butyl stearate, glyceryl trioleate,
oleic acid, butyl oleate, and butyl benzyl sebacate.

15 In the case of polyisobutylene, polyisoprene, and
isobutylene-isoprene copolymer the preferred plasticizers
include polylimonene, petrolatum, mineral oil, squalane,
squalene, and liquid hydrocarbons.

The primary resin component used in the present
20 invention is high molecular weight polyvinyl acetate, i.e.,
at least about 20,000 M.W.U. Other resins which may be
employed herein, depending upon the properties desired in
final gum base, may include polyvinyl butyl ester, copoly-
mers of vinyl esters and vinyl ethers, polyethylene,
25 ethylene-vinyl acetate copolymers, vinyl acetate-vinyl
alcohol copolymers, vinyl acetate - vinyl laurate copolymers.
The resin component of the gum base can be present in an
amount of from about 5 to about 75% of the gum base and
preferably constitutes from about 10 to about 45% by
30 weight of the gum base.

1 As set forth above high molecular weight poly-
vinyl acetate is the preferred resin, especially where the
gum base is to be used in a bubble gum. In this case, the
resin can be properly plasticized using unique plasticizers,
5 such as glyceryl triacetate, acetylated monoglyceride, benzyl
benzoate, benzyl butyrate, benzyl phenyl acetate, butyl-2-
decenoate, citronellyl butyrate, cresyl acetate, ethyl acetate,
diethyl malonate, diethyl sebacate, triethyl citrate, diethyl
succinate, glyceryl tributyrate, ethyl laurate, ethyl
10 acetoacetate, diethyl tartrate, ethyl or butyl lactate,
acetyl triethyl citrate, diethyl malate, ethyl oleate,
sucrose octaacetate, diacetyl tartaric acid ester of mono
and diglycerides, stearyl monoglyceridyl citrate, castor
oil, succinylated monoglycerides, lactic and glyceryl
15 lacto esters of fatty acids, or combinations thereof, with
the glyceryl triacetate and acetylated monoglyceride com-
bination being preferred.

With respect to the resin component the plasticizer
is included in an amount based on weight of the gum base of
20 from about 1% to about 25% and preferably from about 2%
to about 15%.

In essence, it has been found that by use of
the present invention gum bases may be formed from the
elastomer component in combination with high molecular
25 weight polyvinyl acetate. This eliminates the need for
ester gums with SBR and, therefore, the accompanying
antioxidants usually included with ester gums. In the
case of PIB, the need for filler and hydrogenated oils
or fats has been eliminated and/or reduced significantly;
30 and, with respect to isobutylene-isoprene copolymer, a
good film-forming base can be provided in the absence of



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1 filler and ester gums, thus making it useable as a bubble gum base. Furthermore, and quite surprisingly, such combinations can be effected without the inclusion of ingredients such as filler, waxes, etc. However, it will
5 be appreciated that a certain amount of ingredients such as ester gums, fillers, waxes, emulsifiers, colorants, etc. may wish to be included to achieve desired properties without detracting from the overall effect of the present invention.

10 The fillers which can be used in the present gum base in an amount ranging from about 0 to about 60%, and preferably ranging from about 5 to about 45% by weight of the gum base. Examples of fillers suitable for use include, but are not limited to, calcium carbonate,
15 bonate, aluminum hydroxide, alumina, magnesium carbonate, dicalcium phosphate, talc ($3\text{MgO} \cdot 4\text{SiO}_2 \cdot \text{H}_2\text{O}$), magnesium trisilicate, magnesium hydroxide, aluminum silicates, silica gel, organic fillers and combinations thereof. Calcium carbonate is preferred. However, where acid flavors and/or
20 acid sweeteners, such as the free acid form of saccharin, acid cyclamate or aspartame, are employed in the final chewing gum it is preferred to employ a non-chalk filler, preferably talc.

The gum base of the invention can also include
25 waxes which serve as lubricants and should have a melting point of above about 35°C and preferably above about 50°C . Examples of such waxes include candelilla wax, carnauba wax, ozokerite, oricury, microcrystalline wax, refined paraffin wax and the like. The waxes will be employed in an
30 amount within the range of from about 1 to about 18% by weight of the gum base, and preferably from about 3 to about 12%. The

1 preferred waxes are microcrystalline wax, and paraffin
wax employed in combination so that from about 0 to about
18% (based on the weight of the gum base) of the micro-
crystalline wax is employed with from about 0 to about 18%
5 (based on the weight of the gum base) of the paraffin wax.
The waxes are found to reduce the tackiness of the final
gum composition without significantly reducing cohesivity
thereof.

The base of the invention can also include a
10 softening agent and lubricant combination which may com-
prise one or more hydrogenated vegetable or animal fats
having a melting point that is above about 22°C, and
preferably above about 40°C; such softening agent and/or
lubricant may be employed in amounts ranging from about 0
15 to about 10% by weight of the gum base, and preferably
from about 0.5 to about 7%. Examples of softeners suit-
able for use herein include, but are not limited to, glyceryl
monostearate, lecithin, coconut oil, fatty acids, such as
stearic, oleic and palmitic, partially hydrolyzed polyvinyl
20 esters, waxes, such as carnauba wax, candelilla wax and
beeswax and cellulose derivatives and mono-, di- and tri-
glyceryl esters of fatty acids as described hereinbefore.

An emulsifier can also be included to impart
hydrophilic/hydrophobic balance to the gum base so that
25 saliva will be absorbed thereby making the gum base slippery;
the emulsifier will be employed in amounts ranging from
about 0 to about 10% by weight of the gum base, and pre-
ferably from about 3 to about 9%. Examples of such emul-
sifiers include glyceryl monostearate, phosphatides, such
30 as lecithin and cephalin, Tweens, Spans and mixtures thereof.

1 In addition, the gum base can include colorants/
pigments, such as titanium dioxide, and anti-oxidants (when
necessary to stabilize non-inventive ingredients) in an
amount up to 1000 ppm of the gum base, such as butylated
5 hydroxyanisole, butylated hydroxy toluene, and propyl
gallate.

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1 The following are general gum base formulations
in accordance with the present invention.

5 Formulation I

% by Weight
of Gum Base

Elastomer Component

Elastomer - Styrene-butadiene
copolymer

0.5 to 30%

10 Plasticizer - Butyl Stearate,
glyceryl trioleate, oleic acid
or other unique plasticizers as
defined herein

0.5 to 40%

15 Resin Component

Resin - Polyvinyl acetate
(M.W. Greater than 20,000)

5 to 75%

20 Plasticizer - triacetin and
acetylated monoglyceride, or other
unique plasticizers as defined herein

1 to 25%

Optional Third Component(s)

25 Filler (CaCO_3 or Talc)

0 to 60%

Waxes

0 to 18%

Texturizing/Emulsifying Agents

0 to 10%

30

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1 Formulation II

% by Weight
of Gum Base

Elastomer Component

5 Elastomer - Polyisobutylene,
Polyisoprene, and Isobutylene -
Isoprene Copolymer 0.5 to 30%

10 Plasticizer - Polylimonene,
petrolatum, squalene, squalane,
and other unique plasticizers as
defined herein. 0.5 to 40%

Resin Component

15 Resin - Polyvinyl acetate
(M.W. Greater than 20,000) 5 to 75%

20 Plasticizer - triacetin and
acetylated monoglyceride, or other
unique plasticizers as defined herein. 1 to 25%

Optional Third Component(s)

Filler (CaCO_3 or Talc) 0 to 60%

Waxes 0 to 18%

25 Texturizing/Emulsifying agents 0 to 10%

30

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1 It will be appreciated that in the above formu-
lation where a unique type plasticizer is employed with
the resin and/or elastomer, an ester gum or other tackify-
ing plasticizer and/or additive may optionally be employed
5 in conjunction with the unique plasticizers. However, the
amounts of ester gums or other tackifying plasticizers and/
or additives employed in such cases will be relatively small
so that the gum base produced may still be provided with sub-
stantially reduced tackiness. Examples of ester gums which
10 may optionally be present herein comprise hydrogenated ester
gum, that is, glycerol ester of hydrogenated rosin and/or
dimerized ester gum, pentaerythritol ester gum, polymerized
ester gum, and ester gum. The ester gums may be employed
in an amount ranging from about 0 to about 10%, preferably
15 from about 2 to about 7% by weight of the gum base.

 In any event, the gum bases of the invention
may be formed by preforming each of the primary components
and thereafter combining them to form the gum base.

 The gum base of the invention may be employed
20 in forming a chewing gum and in such case the gum base will
be present in an amount within the range of from about 10
to about 40% and preferably from about 15 to about 30% by
weight of the chewing gum.

 The chewing gum of the invention may be of the
25 sugar-containing or sugarless variety. Examples of
sweeteners which may be employed include sugars, for
example, monosaccharides, of 5 or 6 carbon atoms, such as
arabinose, xylose, ribose, glucose, mannose, galactose,
fructose, dextrose, or sorbose or mixtures of two or more
30 of the foregoing monosaccharides; disaccharides, for example,
sucrose, such as cane or beet sugar, lactose, maltose or

1 cellobiose; polysaccharides, such as partially hydrolyzed
starch or dextrin, as well as sugar alcohols, such as
sorbitol, mannitol, xylitol, mixtures thereof, as well as
hydrogenated starch hydrolysates or isomaltitol, and mix-
5 tures of two or more of the above sugars and/or sugar
alcohols.

Any of the above sugars may be present in an
amount of within the range of from about 0.05 to about
90% and preferably from about 40 to about 85% by weight
10 of the chewing gum. The sugar alcohols, where present,
will be employed in an amount of from about 0.05 to about
90% and preferably from about 40 to about 85% by weight
of the chewing gum.

The chewing gum of the invention may also con-
15 tain in lieu of or in addition to any of the above sugars
or sugar alcohols an artificial sweetener, such as, for
example, aspartame, cyclamate, or a saccharin or other
sweetener as set out hereinafter, the artificial sweetener
being present in an amount of from about 0 to about 1.5%
20 by weight, and preferably, from about 0.05 to about 0.3%
by weight of the chewing gum.

Examples of artificial and natural sweeteners
which may be employed herein include sodium, calcium or
ammonium saccharin salts, dihydrochalcones, glycyrrhizin,
25 dipotassium glycyrrhizin, glycyrrhizic acid ammonium salt,
L-aspartyl-L-phenylalanine methyl ester (aspartame), the
sodium, ammonium or calcium salt of 3,4-dihydro-6-methyl-
1,2,3-oxathiazine-4-one-2,2-dioxide, the potassium salt
of 3,4-dihydro-6-methyl-1,2,3-oxathiazine-4-one-2,2-dioxide
30 (Acesulfame-K), as well as Thaumatococcus Daniellii (Thau-
matin I and II), Stevia rebaudiana (Stevioside), Richardella
dulcifica (Miracle Berry), Dioscoreophyllum cumminsii

- 1 (Serendipity Berry), cyclamate salts, and the like, or mixtures of any two or more of the above.

The chewing gum of the invention may include flavoring, such as sour or fruit flavoring or non-acid
5 or mint flavoring in an amount ranging from about 0.5 to about 2% by weight of the final chewing gum product. The flavoring may comprise synthetic flavors and oils derived from plants, leaves, flowers, fruit, etc. Representative fruit flavor adjuncts include acids, such as adipic, citric,
10 succinic and fumaric acid, and citrus oils, such as lemon oil, orange oil, lime oil, grapefruit oil, and fruit essences, such as apple essence, pear essence, peach essence, strawberry essence, apricot essence, raspberry essence, cherry essence, plum essence, pineapple essence, as
15 well as the following essential oils: peppermint oil, spearmint oil, mixtures of peppermint oil and spearmint oil, clove oil, bay oil, anise oil, eucalyptus oil, thyme oil, cedar leaf oil, cinnamon oil, oil of nutmeg, oil of sage, oil of bitter almonds, cassia oil, and methylsalicylate
20 (oil of wintergreen). Various synthetic flavors, such as mixed fruit, may also be incorporated in the chewable gum base with or without conventional preservatives.

By utilizing the proper plasticizer for each of the primary components, the properties of the ultimate gum
25 product can be carefully selected based on the inherent attributes of the component, using other additives to merely enhance, maximize or fine tune the qualities attained by the combination of primary components.

For a better understanding of the present inven-
30 tion, together with other and further objects, reference is made to the following descriptions of specific examples and its scope will be pointed out in the appended claims.

1 EXAMPLES OF THE INVENTION

STYRENE-BUTADIENE ELASTOMER

The first three examples herein demonstrate the ability to produce a soft, workable gum base with styrene-butadiene copolymer as the elastomer and high molecular weight polyvinyl acetate resin without the use of ester gums and in the absence of additional components which in the past have been considered necessary to provide a use-able gum base.

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EXAMPLE 1

A gum base was prepared in accordance with the formula shown below which, it is noted, includes neither filler nor ester gum, thereby eliminating the need for antioxidant(s).

Gum Base IngredientsParts by weight
of the Gum BaseElastomer Component

Styrene-butadiene elastomer

(24% Bound styrene)

15

10 Butyl Stearate

3

Resin Component

Polyvinyl Acetate (20,000-40,000 M.W.U.)

65

Glyceryl Triacetate

9

15 Acetylated Monoglyceride

10

The ingredients were mixed in a Brabender plasticorder at a temperature of about 80°C by adding a first portion of the polyvinyl acetate to the SBR, followed by the butyl stearate, the remaining PVAc, the glyceryl triacetate, and acetylated monoglyceride.

The gum base was found to be smooth, and semi-fluid, flowed easily at the mixing temperature, and retained a fairly constant viscosity as ingredients were added, all of which enhance the economic value of the base since the energy required for blending is thereby minimized.

On cooling, no phase separation was observed and the base possessed film-forming attributes, i.e., it had good bubble-forming properties and could be used as a base for bubble gum. The gum base was also non-stick (adhesive), chewed well, had a bland taste, and good organoleptic

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1 quality, i.e., good mouth feel. Since there was no filler
included therein, the gum base can be used with acid
sweeteners and/or flavors.

Moreover, and perhaps most importantly, the cooled
5 base was soft and easily deformable in contrast to the
impenetrable, hard, brittle nature of SBR gum bases known
to date. This soft texture markedly increases the economic
value of the base because of the reduced work energy required
to mechanically masticate the soft base when preparing a
10 chewing gum composition.

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EXAMPLE 2

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This example shows a styrene-butadiene gum base with the same amount of elastomer as the first example but with a different composition of elastomer and plasticizer therefor.

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Gum Base Ingredients

Parts by Weight
of the Gum Base

Elastomer Component

Styrene-butadiene elastomer

(24% Bound styrene)

10

10 Styrene-butadiene elastomer

(48% Bound styrene)

5

Butyl Stearate

3

Glyceryl trioleate

3

15

Resin Component

Polyvinyl Acetate

(M.W. 20,000-40,000)

65

Glyceryl Triacetate

7

Acetylated Monoglyceride

7

20

The ingredients were mixed in a Brabender plasticorder as in Example 1 with the same favorable mixing characteristics.

Again there was no observable phase separation upon cooling and the base had good film-forming properties as well as displaying a bland taste, good organoleptic quality, adhesivity, and a generally soft, deformable or malleable texture.

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EXAMPLE 3

Another example was prepared in accordance with the formula shown below wherein the amount of elastomer was increased and in which low molecular weight

5 polyvinyl acetate was included.

Parts By Weight
of the Gum Base

Gum Base Ingredients

Elastomer Component

Styrene-butadiene elastomer	20
Butyl stearate	5

10

Resin Component

Polyvinyl Acetate	
(M.W. 20,000-40,000)	40
Low Molecular Weight	
15 Polyvinyl Acetate	25
Glyceryl Triacetate	7
Acetylated Monoglyceride	3

The resulting gum base, which was mixed as in 20 the Examples 1 and 2, enjoyed the same advantageous soft, malleable texture while having good film-forming and adhesive properties.

These formulae provide excellent economical bases for bubble gum because of their good film-forming 25 ability and adhesivity.

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1 In order to demonstrate the unexpected results
relative to producing a soft styrene-butadiene base in
the absence of ester gum by use of the present invention,
tests were conducted on samples of gum base produced in
5 Examples 1, 2 and 3. Since production of a chewing gum
composition includes the process of mechanical mastication
of the gum base along with the other gum composition in-
gredients, the ease with which the gum base can be deformed
under mechanical pressure is a good measure of its proces-
10 sability. Accordingly, one type of test that can be made
to determine the processability of a gum base is a hardness
test which is the measure of the resistance of a material
to local deformation. Hardness tests generally measure
the depth of penetration of an indenter or probe under a
15 specific set of conditions.

Samples from the gum bases prepared in the
above Examples were subjected to hardness tests according
to ASTM D-1321 employing a penetrometer (Precision
Scientific Co.), as were also samples of styrene-butadiene
20 elastomer gum base ester gum included therein as a
film-forming ingredient. These tests were conducted at
room temperature (24.5°C) under a constant load of 100
gms.

SBR ester base, which is commonly used as the
25 gum base for bubble gum compositions and is used commer-
cially has the following general formula:

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SBR/Ester Gum Base

Parts By Weight
of the Gum Base

Styrene-butadiene Copolymer

6 to 14%

Ester Gum

18 to 36%

5 Filler (usually CaCO_3)

18 to 44%

Low Molecular Weight PVAc (Organic Filler)

15 to 45%

Waxes

1 to 26%

Fatty Acid Esters

6 to 15%

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Samples A, B and C were of the SBR/ester gum general formula indicated above, with the exception of Sample C, which contained no fillers.

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Each of the samples were subjected to 3 to 5 runs each under the penetrometer and the mean value of penetration in 1/10 millimeters after 5 seconds under constant load was determined in order to minimize the effect of any anomolous results.

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1 Results of the comparative tests are set forth
below in Table I.

5 TABLE I
Penetrometer Test

Samples		Mean Penetration measured after 5 seconds under constant load of 100 gms. at 24.5°C
From Example 1		38.5
From Example 2		26.8
From Example 3		25.6
SBR/Ester	A	4.0
SBR/Ester	B	1.3
SBR/Ester	C (No filler)	5.0

15 As evident from the data, the Samples 1, 2 and
3 exhibited a surprisingly lower degree of hardness thus
evidencing a highly malleable gum base prepared according
to the invention.

20 While samples of the invention registered a degree
of softness clearly an order of magnitude greater than the
samples taken from the art, it is believed that gum base
measuring no less than about 15 "one-tenth millimeter units"
in the above test would offer a significant advantage over
25 the prior art gum bases. Preferably, the gum base would
measure no less than about 20, and most preferably no less
than about 25.

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EXAMPLES 4-6

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Chewing gum compositions were prepared utilizing the bases of Examples 1, 2 and 3 according to the following formula:

<u>Ingredient</u>	<u>Parts By Weight of the Chewing Gum</u>
Novel Gum Base (as described in Examples 1, 2 and 3)	24
Sugar Pulverized	60
Corn Syrup 43° Be	15
Flavor	1

These chewing gums were found to have a soft texture, good bubble-forming quality, and good organoleptic qualities, as well as having good shelf life.

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1 The following Examples represent other preferred embodiments of the present invention which include additional ingredients generally used in gum bases.

EXAMPLE 7

5 A non-tacky gum base of the following formulation was prepared as described below.

<u>Gum Base Ingredients</u>		<u>Parts by Weight of the Gum Base</u>
<u>Elastomer Component</u>		
10 Styrene-butadiene elastomer		
(24% Bound styrene)		10
Butyl stearate		10
CaCO ₃		17
<u>Resin Component</u>		
15 Polyvinyl acetate		
(M.W. 20,000-40,000)		27
Glyceryl triacetate		4
Acetylated monoglyceride		5
20 CaCO ₃		8
<u>Third Texturizing Component</u>		
Triglyceride		6
25 Microcrystalline wax		
(melting point - 160°F)		4
CaCO ₃		9

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1 The styrene-butadiene elastomer and butyl
stearate were mixed in a kettle mixer at a temperature
of about 120°C to form the properly plasticized elastomer
component, which was added to a Brabender plasti-corder
5 having sigma blades and maintained at 120°C. Thereafter
triglyceride was added with mixing, followed by CaCO_3 ,
polyvinyl acetate, acetylated monoglyceride, and glyceryl
triacetate. A second part of CaCO_3 was then added with
mixing, followed by microcrystalline wax, and a third
10 portion of CaCO_3 .

The gum base thereby formed was found to be
smooth, semi-fluid and flowed easily at mixing temperature.
The base viscosity remained fairly constant as the ingre-
dients were added. On cooling, no phase separation of
15 ingredients was observed.

The above gum base of the invention was non-
stick, chewed well, had a good mouth feel, a bland taste
and good bubble-blowing properties.

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EXAMPLE 8

A non-tacky chalk-free gum base of the following composition was prepared as described below.

5	<u>Gum Base Ingredients</u>	<u>Parts by Weight of the Gum Base</u>
	<u>Elastomer Component</u>	
	Styrene-butadiene	
	(24% Bound styrene)	11
	Butyl stearate	11
10	Talc	15
	<u>Resin Component</u>	
	Polyvinyl acetate (M.W. 20,000-40,000)	30
	Glyceryl triacetate	5
15	Acetylated monoglyceride	6
	Talc	5
	<u>Third Texturizing Component</u>	
	Triglyceride	7
20	Microcrystalline wax	5
	Talc	5

The styrene-butadiene elastomer and butyl stearate were mixed in a kettle mixer at a temperature of about 100°C to form the plasticized elastomer component, which was then added to a Brabender plasti-corder having roller blades and maintained at 110°C. Thereafter the triglyceride was added with mixing, followed by talc, polyvinyl acetate, acetylated monoglyceride, and glyceryl triacetate. A second part of talc was then added with mixing, followed by microcrystalline wax and a third portion of talc.

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1 The gum base thereby formed was found to be smooth
and fluid at mixing temperature. The base viscosity remained
fairly constant as the ingredients were added. On cooling,
no phase separation of ingredients was observed. The above
5 gum base of the invention was non-stick, chewed well, had
a good mouth feel, a bland taste, and good bubble-forming
properties.

 In addition, since this base is free of CaCO_3 ,
it can be used with acid flavors and/or acid sweeteners,
10 such as aspartame and free acid form of saccharin.

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EXAMPLE 9

A non-tacky chalk-free gum base of the following composition was prepared as described below.

5 Gum Base Ingredients

Parts by Weight
of the Gum Base

Elastomer Component

SBR (24% Bound Styrene)	2.7
SBR (48% Bound Styrene)	7.7
n-Butyl stearate	10.4
10 Talc	15

Resin Component

Polyvinyl acetate (M.W. 20,000-40,000)	30
Glyceryl triacetate	5
15 Acetylated monoglyceride	5
Talc	5

Third Texturizing Component

Triglyceride	7
20 Paraffin Wax	4.1
Microcrystalline wax	4.1
Talc	4

Each of the styrene-butadiene elastomers was
 25 separately mixed with butyl stearate in a kettle mixer
 at a temperature of about 100°C, after which the two
 styrene-butadiene elastomer-butyl stearate batches were
 added to a Brabender plasti-corder having roller blades
 and maintained at 110°C. Thereafter, the triglyceride was
 30 added with mixing followed by talc, polyvinyl acetate,
 acetylated monoglyceride, and glyceryl triacetate. A

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1 second part of talc was then added with mixing followed
by paraffin wax, microcrystalline wax and a third part
of talc.

5 The gum base thereby formed was found to be smooth
semi-fluid and flowed easily at mixing temperature. The base
viscosity remained fairly constant as the ingredients were added.
On cooling, no phase separation of ingredients was observed.

10 The above gum base of the invention was non-
stick, chewed well, had a good mouth feel and bounce, a
bland taste, and good bubble forming properties.

In addition, since it is free of CaCO_3 , this gum
base can be used with acid flavors and/or acid sweeteners
such as aspartame and free acid form of saccharin.

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EXAMPLE 10

A non-tacky chalk-containing gum base of the following composition was prepared as described below.

<u>5 Gum Base Ingredients</u>		<u>Parts By Weight of the Gum Base</u>
<u>Elastomer Component</u>		
Styrene-butadiene elastomer		
(24% Bound Styrene)		2
Styrene-butadiene elastomer		
(48% Bound Styrene)		7.2
10 Ester gum		9
CaCO ₃		25
<u>Resin Component</u>		
15 Polyvinyl acetate -		
(M.W. 20,000-40,000)		22
Polyvinyl acetate -		
(M.W. 7,000-17,000)		5.3
Glyceryl Triacetate		5
20 CaCO ₃		5
<u>Third Texturizing Component</u>		
Paraffin Wax		5.3
Microcrystalline wax		4.8
25 CaCO ₃		9.4

The styrene-butadiene elastomers and ester gum were mixed at about 120°C to form the properly plasticized elastomer component, which was then added to a 30 Brabender plasti-corder having sigma blades and maintained at 120°C. Thereafter CaCO₃ was added with mixing followed

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1 by polyvinyl acetate, and glyceryl triacetate. A second
part of CaCO_3 was then added with mixing followed by para-
ffin wax, microcrystalline wax and a third portion of CaCO_3 .

5 The gum base thereby formed was found to be smooth,
semi-fluid and flowed easily at mixing temperature. The
base viscosity remained fairly constant as the ingredients
were added. On cooling, no phase separation of ingredients
was observed.

10 The above gum base of the invention was non-stick,
chewed well, had a good mouth feel, bland taste, and good
bubble-forming properties. Also, the addition of 9% ester
gum did not significantly affect the abhesive properties of
the base.

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EXAMPLE 11

A non-tacky filler-free gum base of the following composition was prepared as described below.

5 <u>Gum Base Ingredients</u>	<u>Parts By Weight of the Gum Base</u>
<u>Elastomer Component</u>	
Styrene-butadiene elastomer	
(48% Bound Styrene)	10
Butyl stearate	10
10	
<u>Resin Component</u>	
Polyvinyl acetate	
(M.W. 20,000-40,000)	30
Glyceryl Triacetate	5
15 Acetylated monoglyceride	5
<u>Third Texturizing Component</u>	
Triglyceride	10
Paraffin wax	18
20 Candelilla wax	5
Glyceryl monostearate	7

The styrene-butadiene elastomer and butyl stearate were mixed in a kettle mixer at a temperature of about 120°C to thereby form the plasticized elastomer component which was added to a Brabender plasti-corder having sigma blades and maintained at 120°C. Thereafter, triglyceride was added with mixing followed by polyvinyl acetate, acetylated monoglyceride, and glyceryl triacetate. Glyceryl monostearate was then added with mixing followed by paraffin wax and candelilla wax.

1 The gum base thereby formed was found to be smooth,
semi-fluid and flowed easily at mixing temperature. The
base viscosity remained fairly constant as the ingredients
were added. On cooling, no phase separation of ingredients
5 was observed.

 The above gum base of the invention was non-stick,
chewed well, had a good mouth feel, bland taste, and good
bubble-blowing properties. In addition, since the above
base is free of fillers, it can be used with acid flavors
10 and/or acid sweetners.

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EXAMPLE 12

A non-tacky chalk-free gum base of the following composition was prepared as described below.

<u>5 Gum Base Ingredients</u>		<u>Parts by Weight of the Gum Base</u>
<u>Elastomer Component</u>		
SBR (24% Bound Styrene)		3
SBR (48% Bound Styrene)		7
Glyceryl Trioleate		8
10 Ester Gum		5
Talc		20
<u>Resin Component</u>		
Polyvinyl acetate (M.W. 20,000-40,000)		25
15 Glyceryl Tributyrat		3
Acetylated Monoglyceride		5
Talc		5
<u>Third Texturizing Component</u>		
20 Triglyceride		5
Microcrystalline wax		5
Talc		9

Each of the styrene-butadiene elastomers was
25 separately mixed with glyceryl trioleate in a kettle mixer
at a temperature of about 100°C.

The two styrene-butadiene elastomer-glyceryl
trioleate batches were added to a Brabender plasti-corder
having roller blades and maintained at 110°C. The ester
30 gum was then added and mixed. Thereafter the triglyceride
was added with mixing followed by talc, polyvinyl acetate,

1 acetylated monoglyceride, and glyceryl tributyrates. A
second part of talc was then added with mixing followed
by microcrystalline wax, and a third portion of talc.

5 The gum base thereby formed was found to be
smooth, semi-fluid and flowed easily at mixing temperature.
The base viscosity remained fairly constant as the ingre-
dients were added. On cooling, no phase separation of
ingredients was observed.

10 The above gum base of the invention was non-stick,
chewed well, had a good mouth feel and bounce, a bland taste,
and good bubble-forming properties.

In addition, since it is free of CaCO_3 , this gum
base can be used with acid flavors and/or acid sweeteners
such as aspartame and free acid form of saccharin. Also,
15 the addition of 5% ester gum did not significantly affect
the adhesive properties of the base.

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EXAMPLE 13

A non-tacky chalk free gum base of the following composition was prepared as described below.

<u>5 Gum Base Ingredients</u>		<u>Parts by Weight of the Gum Base</u>
<u>Elastomer Component</u>		
SBR (24% Bound Styrene)		3
SBR (48% Bound Styrene)		7
Oleic acid		8
10 Ester Gum		10
Talc		20
<u>Resin Component</u>		
Polyvinyl acetate (M.W. 20,000-40,000)		25
15 Acetyl triethyl citrate		3
Acetylated monoglyceride		4
Talc		5
<u>Third Texturizing Component</u>		
20 Microcrystalline wax		6
Talc		9

Each of the styrene-butadiene elastomers was separately mixed with oleic acid in a kettle mixer at 25 a temperature of about 100°C.

The two styrene-butadiene elastomer-oleic acid batches were introduced into a Brabender plasti-corder having roller blades and maintained at 110°C. The ester gum was then added and mixed. Thereafter, talc was 30 added with mixing followed by polyvinyl acetate, acetylated monoglyceride, and acetyl triethyl citrate. A second part of talc was then added with mixing followed by microcrystalline wax, and a third portion of talc.

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1 The gum base thereby formed was found to be
smooth, semi-fluid and flowed easily at mixing temperature.
The base viscosity remained fairly constant as the ingre-
dients were added. On cooling, no phase separation of
5 ingredients was observed.

The above gum base of the invention was non-
stick, chewed well, had a good mouth feel and bounce, a
bland taste, and good bubble-forming properties.

10 In addition, since it is free of CaCO_3 , the gum
base can be used with acid flavors and/or acid sweeteners
such as aspartame and free acid form of saccharin. Also,
the addition of 10% ester gum did not significantly affect
the abhesive properties of the base.

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POLYISOBUTYLENE ELASTOMER

As in the case of styrene-butadiene copolymer
elastomer bases, gum bases which included polyisobutylene
as the elastomer component were prepared in accordance
5 with the present invention. Once again, and contrary to
common practice in the art of preparing polyisobutylene
gum bases having good film-forming properties, it was
found that by use of the present invention neither filler
nor other ingredients normally associated with compati-
10 bilizing the primary components, such as hydrogenated
animals fats or vegetable oils, were required to produce
a soft, essentially non-tacky base.

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EXAMPLE 14

A polyisobutylene gum base was prepared as described below according to the following formula.

5 <u>Gum Base Ingredients</u>	<u>Parts by Weight of the Gum Base</u>
<u>Elastomer Component</u>	
Polyisobutylene elastomer	15
Polylimonene	3
10	<u>Resin Component</u>
Polyvinyl acetate (M.W. 20,000-40,000)	65
Glycerol Triacetate	9
Acetylated Monoglyceride	8

15 The ingredients were mixed in a Brabender plasticorder at a temperature of about 80°C by introducing the polyisobutylene elastomer followed by a first portion of the polyvinyl acetate, the polylimonene, a second portion of the polyvinyl acetate, glyceryl triacetate, and the
20 acetylated monoglyceride.

The gum base formed was found to be smooth, semi-fluid, flowed easily at the mixing temperature, and retained a constant viscosity as the ingredients were added, thus enhancing the economic value of the base since the energy
25 required for blending is minimized by these attributes.

On cooling, no phase separation was observed and the base had excellent film-forming attributes and could be used as a base for bubble gum. The gum base was also non-tacky, chewed well, had a bland taste, and
30 good organoleptic quality, i.e., mouth feel. Since there was no filler included therein, the gum base can be used with acid sweeteners/flavors.

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1 Just as with the SBR/non-filler base, the cooled
base was soft and easily deformable, thus increasing the
economic value thereof because of the reduced work energy
required to mechanically masticate the soft base when
5 preparing a chewing gum composition.

Again, in order to demonstrate the surprising
results of the present invention relative to yielding a
soft base in the absence of filler and other components,
such as hydrogenated vegetable oil, a sample of the poly-
10 isobutylene gum base and a sample of a commercially-
available polyisobutylene base were subjected to the hard-
ness test as described herein relative to the styrene-
butadiene gum base. A representative formula of the com-
mercial base used herein, which is commercially available,
15 is as follows:

<u>Polyisobutylene Base</u>	<u>Parts by Weight of the Gum Base</u>
Polyisobutylene	8-14%
PVAc High Molecular Weight	30-40%
20 Filler	20-30%
Waxes	8-15%
Fatty Acid Esters	8-15%
Softeners	0- 5%

25 Each of the samples were subjected to 3 to 5
runs each under the penetrometer, the mean value of
penetration in 1/10 millimeters after 5 seconds at a
constant load of 100 gms being determined to minimize
the effect of anomalous results.
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1 Results of the comparative tests are set forth
Below in Table II.

TABLE II

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Penetrometer Test

<u>Sample</u>		Mean Penetration Measured After 5 Seconds Under Constant Load of 100 gms. at 24.5°C
10 From Example 14		31
Commercial PIB Base		4.0

15 It is apparent from the data that the sample
from Example 14 prepared according to the invention ex-
hibited a degree of hardness an order of magnitude lower
than the commercial PIB base even though the comparison
sample included filler component which may be expected
to cause discontinuity thus a softening effect in gum base.

20 As explained hereinbefore, while the difference
in softness of the gum base prepared in accordance with the
invention is an order of magnitude greater, it is believed
that gum base registering at least about 15 in accordance
with the above test represents a significant advance in
the art of producing gum bases; the preferred softness
25 measuring at least about 20 and most preferably at least
about 25.

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EXAMPLE 15

A chewing gum composition was prepared utilizing the base of Example 14 according to the following formula.

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<u>Ingredient</u>	<u>Parts by Weight of the Chewing Gum</u>
Novel PIB Gum Base (as described in Example 14)	24
Sugar Pulverized	60
10 Corn Syrup 43° Be	15
Flavor	1

15 This chewing gum was found to have a soft texture, good bubble-forming quality, and good organoleptic qualities, as well as having good shelf-life.

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ISOBUTYLENE-ISOPRENE COPOLYMER

(Butyl Rubber Elastomer)

Further experimentation included production of gum bases according to the invention which included properly plasticized isobutylene-isoprene copolymer as the elastomer component. While butyl rubber is known to be used extensively as a base in stick gum which does not require a high degree of film-forming attributes, the examples described below show that a butyl rubber base including the excellent film-forming high molecular weight polyvinyl acetate can be produced by applying the principles set forth in the invention relative to proper external plasticization. Moreover, the base produced thereby was soft and essentially non-tacky.

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Parts By Weight of the Gum Base

Isobutylene-Isoprene Copolymer
(Butyl Rubber)

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Polyvinyl Acetate

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1 The cooled base was soft and easily deformable
which, again, markedly increases the economic value of
the base because of the reduced work energy required to
mechanically masticate the soft base when preparing a
5 chewing gum composition.

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EXAMPLE 17

A chewing gum composition was prepared utilizing the butyl rubber base of Example 16 according to the following formula.

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Ingredient

Parts by Weight
of the Chewing Gum

Novel Gum Base (as described
in Example 16)

24

Sugar Pulverized

60

10 Corn Syrup 43° Be.
Flavor

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The chewing gums were found to have a soft texture, good bubble-forming quality and good organoleptic qualities, as well as having good shelf life.

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EXAMPLE 18

A non-tacky chalk-free butyl rubber gum base was prepared which included other usual gum base components as described below.

5

Gum Base Ingredients

Parts by Weight
of the Gum Base

Elastomer Component

Butyl rubber (copolymer of isobutylene
and isoprene (99:1)) 10

10 Petrolatum 10

Talc 19

Resin Component

Polyvinyl acetate
(M.W. 20,000-40,000) 30

Glyceryl triacetate 3

Acetylated monoglyceride 6

Talc 8

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Third Texturizing Component

Triglyceride 10

Talc 4

25 Into a Brabender plasti-corder having roller blades and maintained at 110°C was added butyl rubber, petrolatum, after which triglyceride was added with mixing, as well as talc, polyvinyl acetate, acetylated monoglyceride, and glyceryl triacetate. A second portion of talc was then added with mixing.

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- 1 The gum base thereby formed was found to be smooth and fluid at 110°C. The base viscosity remained fairly constant as the ingredients were added. On cooling, no phase separation of ingredient was observed.
- 5 The above gum base of the invention was non-stick, chewed well, had a good mouth feel and a bland taste. Since the above base is free of CaCO_3 , it can be used with acid flavors and/or acid sweeteners, such as aspartame and the free acid form of saccharin.
- 10 Further chewing gum compositions can be prepared from the novel gum bases disclosed herein as set forth below.

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EXAMPLE 19

A non-tacky bubble gum having the following composition is prepared as described below.

5 <u>Ingredient</u>	<u>Parts by Weight of the Chewing Gum</u>
Gum Base (as described in Examples 8 and 18)	22
Sugar pulverized	52
Corn syrup 43° Be	23
10 Flavor	1
Emulsifiers	1.5
Color	0.05

The gum base is melted in a kettle at 150°F and a small portion (10-15%) of the pulverized sugar and the corn syrup are added with mixing over a 5 minute period. Thereafter, the remaining ingredients are added according to conventional chewing gum making practice to form a non-tacky chewing gum in accordance with the invention which has excellent softness and shelf-life.

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EXAMPLE 20

A non-tacky bubble gum having the following composition is prepared as described below.

5 Ingredients

Parts by Weight
of the Chewing Gum

Bubble gum base (as described	
in Examples 7 and 18)	24
Sugar pulverized	61
High fructose corn syrup	
10 (42% fructose, 29% H ₂ O)	14
Flavor	1

The gum base is melted in a kettle at 150°F and a small portion (10-15%) of the pulverized sugar and the high fructose corn syrup are added with mixing over a 5 minuted period. Thereafter, the remaining ingredients are added according to conventional chewing gum practice to form a non-tacky chewing gum in accordance with the invention which has excellent softness and shelf-life, has extended flavor and sweetness and very good bubble blowing properties.

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EXAMPLE 21

A non-tacky chewing gum having reduced calorie content, in accordance with the present invention, is prepared as described below from the following ingredients.

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<u>Ingredients</u>	<u>Parts by Weight</u>
Bubble gum base (as described in Example 10)	24
Lecithin	3.5
10 CaCO ₃	39
Peppermint Oil	1.5
Sodium saccharin	0.1
Mannitol	5.5
Sorbitol Solution (70% solids)	19.5
15 Sorbitol powder	7

The gum base is melted (temperature 270°F) and placed in a standard dough mixer kettle equipped with sigma blades and cooled to 180°F. Lecithin and calcium carbonate are added and mixed for one minute; peppermint oil and sorbitol solution are then added and mixed for two minutes, mannitol is added and mixed for one minute; and sorbitol powder and saccharin are added and mixed for one minute. The gum is discharged from the kettle and is rolled, scored and cut into 3 g sticks or cubes.

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1 The resulting chewing gum product containing
26.5% sorbitol and 5.5% mannitol is found to be non-tacky
and have a pleasant sweet taste and good bubble blowing
properties while having a calorie content of only 2.8
5 calories per piece as opposed to conventional sorbitol
containing sugarless chewing gum containing 63.4% sorbitol
which also has a pleasant sweet taste but contains 7.6
calories per piece. Thus, the sorbitol containing sugar-
less chewing gum of the invention contains only 36.7%
10 of the calorie content of conventional sugarless gum or a
63.3% reduction.

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EXAMPLE 22

A non-tacky sugarless chewing gum having reduced calorie content, in accordance with the present invention, is prepared as described below from the following ingredients.

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<u>Ingredients</u>	<u>Parts by Weight</u>
Gum base (as described in Example 10)	24
Lecithin	3.5
10 CaCO ₃	38
Peppermint oil	1.5
Water	6
Mannitol	5
Sorbitol	22

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The gum base is melted (temperature 270°F) and placed in a standard dough mixer kettle equipped with sigma blades and cooled to 180°F. Lecithin and calcium carbonate are added and mixed for one minute; peppermint oil and water are then added and mixed for two minutes. The water is added to control air entrapment and resultant cud swelling. The gum is discharged from the kettle and is rolled, scored and cut into 3 g sticks or cubes.

The resulting chewing gum product containing 25 27% sugar alcohols is found to be non-tacky and have a pleasant sweet taste and good bubble blowing properties while having a calorie content of only about 3 calories per piece as opposed to conventional sugarless containing chewing gum containing 63.4% sorbitol which also has a 30 pleasant sweet taste but contains 7.6 calories per piece.

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1 Thus, the sugarless chewing gum of the invention contains only 39% of the calorie content of conventional sugar gum or a 61% reduction.

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EXAMPLE 23

A non-tacky bubble gum having the following composition is prepared as described below.

5 <u>Ingredient</u>	<u>Parts by Weight of the Chewing Gum</u>
Gum Base (as described in Example 11)	22
Sugar pulverized	52
Corn syrup 43° Be	23
10 Flavor	1
Emulsifiers	1.5
Color	0.05

The gum base is melted in a kettle at 150°F and a small portion (10-15%) of the pulverized sugar and the corn syrup are added with mixing over a 5 minute period. Thereafter, the remaining ingredients are added according to conventional chewing gum making practice to form a non-tacky chewing gum in accordance with the invention which has excellent softness and shelf-life.

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EXAMPLE 24

A non-tacky bubble gum having the following composition is prepared as described below.

5 <u>Ingredient</u>	<u>Parts by Weight of the Chewing Gum</u>
Gum Base (as described in Example 9)	22
Sugar pulverized	52
Corn syrup 43° Be	23
10 Flavor	1
Emulsifiers	1.5
Color	0.05

The gum base is melted in a kettle at 150°F and a small portion (10-15%) of the pulverized sugar and the corn syrup are added with mixing over a 5 minute period. Thereafter, the remaining ingredients are added according to conventional chewing gum making practice to form a non-tacky chewing gum in accordance with the invention which has excellent softness and shelf-life.

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EXAMPLE 25

A non-tacky bubble gum having the following composition is prepared as described below.

5 <u>Ingredient</u>	<u>Parts by Weight of the Chewing Gum</u>
Gum Base (as described in Example 12)	22
Sugar pulverized	52
Corn syrup 43° Be	23
10 Flavor	1
Emulsifiers	1.5
Color	0.05

The gum base is melted in a kettle at 150°F
 15 and a small portion (10-15%) of the pulverized sugar
 and the corn syrup are added with mixing over a 5 minute
 period. Thereafter, the remaining ingredients are added
 according to conventional chewing gum making practice
 to form a non-tacky chewing gum in accordance with the
 20 invention which has excellent softness and shelf-life.

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EXAMPLE 26

A non-tacky bubble gum having the following composition is prepared as described below.

5 <u>Ingredient</u>	<u>Parts by Weight</u> <u>of the Chewing Gum</u>
Gum Base (as described in Example 13)	22
Sugar pulverized	52
Corn syrup 43° Be	23
10 Flavor	1
Emulsifiers	1.5
Color	0.05

15 The gum base is melted in a kettle at 150°F
and a small portion (10-15%) of the pulverized sugar and
the corn syrup are added with mixing over a 5 minute period.
Thereafter, the remaining ingredients are added according
to conventional chewing gum making practice to form a
non-tacky chewing gum in accordance with the invention
20 which has excellent softness and shelf-life.

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1 While there have been described what are
presently believed to be preferred embodiments of
the invention, those skilled in the art will realize
that changes and modifications may be made thereto with-
5 out departing from the spirit of the invention, and it
is intended to claim all such changes and modifications
as fall within the true scope of the invention.

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CLAIMS

1. A homogeneous chewing gum base composition comprising an elastomer properly plasticized to make it compatible with other gum base components; a resin properly plasticized to make it compatible with other gum base components and
5 with said elastomer; and, optionally, a third component comprised of fillers, emulsifying agents, softening agents, texturizing agents, and waxes.

2. A gum base as in Claim 1 wherein said elastomer is styrene-butadiene copolymer, polyisobutylene, polyisoprene,
10 isobutylene-isoprene copolymer, or mixtures thereof.

3. A gum base as in Claim 1 or 2 wherein said resin is polyvinyl acetate.

4. A gum base as in Claim 3 wherein said polyvinyl acetate has a molecular weight of at least about 20,000.

15 5. A gum base as in any of Claims 1-4 wherein the softness is at least about 15 one-tenth millimeters as measured with a penetrometer according to ASTM D-1321 with 100 grams at about 24.5°C, preferably at least about
20 20 one-tenth millimeters and most preferably about 25 one-tenth millimeters.

6. The gum base as in any of Claims 1-5 wherein said elastomer is styrene-butadiene copolymer which is properly plasticized in the absence of ester gums.

7. The gum base as in any of Claims 1-6 wherein
25 said elastomer is properly plasticized with at least one of the following plasticizers: butyl stearate, oleic acid, mono-, di-, or tri-glyceryl esters of the saturated or unsaturated fatty acids of oleic acid, caprylic acid, butyric acid, capric acid, caproic acid, lauric acid,
30 mineral oil, liquid petroleum hydrocarbons, squalane,

1 squalene, castor oil and other ricinoleate derivatives,
 diethylene or propylene glycols and derivatives, tri-
 butyl acetyl citrate, tributyl citrate, lecithin, coconut
 oil, glyceryl tributyrates, Zn laurate, Ca stearate, pro-
 5 pylene glycol monostearate, propylene glycol monolaurate,
 fatty acids, butyl sebacate, butyl benzyl sebacate,
 diacetyl tartaric acid esters of mono- and diglycerides
 of edible fat oils or edible fat forming acids, petro-
 latum, stearyl monoglycerides citrate, limonene, poly-
 10 limonene, liquid waxes, butyl lactate, and butyl oleate.

8. The gum base as in any of Claims 1-6
 wherein said elastomer is styrene-butadiene copolymer and
 said plasticizer is selected from the group consisting of
 butyl stearate, butyl oleate, glyceryl trioleate, and
 15 oleic acid.

9. The gum base as in any of Claims 1-6
 wherein said elastomer is one of polyisobutylene and
 isobutylene-isoprene copolymer and said plasticizer is
 selected from the group consisting of polylimonene,
 20 petrolatum, liquid petroleum hydrocarbons, squalene,
 squalene, and mineral oil.

10. The gum base of Claim 1 wherein said resin
 is properly plasticized with at least one of the following
 plasticizers: glyceryl triacetate, glyceryl tributyrates,
 25 trimethyl citrate, benzyl benzoate, benzyl butyrate, benzyl
 phenyl acetate, butyl-2-decenoate, citronellyl butyrate,
 cresyl acetate, ethyl acetate, diethyl malonate, diethyl
 sebacate, ethylacetoacetate, diethyl tartrate, ethyl lactate,
 butyl lactate, acetyl triethyl citrate, diethyl succinate,
 30 diethyl malate, lactic acid, sucrose octaacetate, diacetyl
 tartaric acid ester of mono- and diglycerides, stearyl

1 18. Use of a chewing gum base as in any of
Claims 1-17 in a chewing gum which includes as sweetener at
least one of the following: mono- and disaccharides,
intense sweeteners of artifical or natural origin,
5 sugar alcohols, hydrogenated starch hydrolysates and corn
syrup.

19. A method of producing the chewing gum base
as in any of Claims 1-18 comprising:

properly plasticizing an elastomer component
10 sufficiently so that it is compatible with a resin component
as well as other gum base ingredients,

properly plasticizing a resin component suf-
ficiently so that it is compatible with an elastomer com-
ponent,

15 mixing said properly plasticized components to
form a single homogeneous gum base mass, and

optionally, adding a third phase of components
to said homogeneous mass to again yield a single phase homo-
geneous gum base mass, which contains desired product
20 characteristics.

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1 mono-glyceridyl citrate, castor oil, succinylated mono-glycerides, or lactic or glyceryl lacto esters of fatty acids, alone or in combination with acetylated monoglyceride.

11. The gum base as in any of Claims 1-10 which
5 is made in the absence of filler.

12. The gum base as in any of Claims 1-10 which also includes filler selected from the group consisting of CaCO_3 , aluminum hydroxide, alumina, magnesium carbonate, dicalcium phosphate, talc ($3\text{MgO} \cdot 4\text{SiO}_2 \cdot \text{H}_2\text{O}$), magnesium
10 trisilicate, magnesium hydroxide, silica gel, aluminum silicates, organic fillers, and combinations thereof.

13. The gum base as in any of Claims 1-12 wherein said elastomer further comprises other masticatory substances of natural origin including rubber latex solids,
15 chicle, crown gum, nispero, rosidinha, jelutong, pendare, perillo, niger gutta, or tunu.

14. The gum base as in any of Claims 1-13 wherein said elastomer is present in said gum base in an amount of from 0.5 to about 30% by weight, preferably from about 5%
20 to about 20%.

15. The gum base as in any of Claims 1-14 wherein said plasticizer for said elastomer is present in an amount of from about 0.5% to about 40% by weight, preferably from about 10% to about 25% by weight of said gum base.

25 16. The gum base as in any of Claims 1-15 wherein said resin is present in said gum base in an amount of from about 5% to about 75% by weight, preferably from about 10% to about 45% by weight.

17. The gum base as in any of Claims 1-16 wherein
30 said resin plasticizer is present in an amount of from about 1 to about 25%, preferably from about 2% to about 15%, by weight of said gum base.